The Impact of Business Environment Reforms on Firms' Performance in Transition Economies

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Abstract

The study investigates the impact of business environment on export performance of individual firms in transition economies. For these goals, the study utilizes the firm-level data from the *Business Environment and Enterprise Performance Survey* (BEEPS V round) across 28 transition economies. Applying the modified CDM model the paper examines the structural link between the business environment reforms, firm R&D, innovation, labor productivity, and export performance. The model was estimated sequentially, step-by-step. The estimates of the structural model, generally, proved our hypothesis about the impact of business environment reforms on the relationships between R&D investments, innovation, labor productivity and export performance. This study also supports the early findings that R&D is an important determinant of innovation, that innovation is a driver of labor productivity and that labor productivity, in turn, substantially increases the probability of firm's participation at export markets.

Keywords: Business environment reforms, R&D, Innovation, Productivity, Export, Transition economies

JEL Classification: D22, O12, O31, O38, P31

1. Introduction

Innovation, productivity growth and exporting are important economic factors that many consider crucial to the economic development and enhancing living standards. The worldwide experience provides plenty evidence that innovation and export promotions are important components of the growth strategy in emerging markets. Discussions of factors that determine success of innovation and export performance have been ongoing for many years. Both the factors that are under the firm control and external factors have been studied extensively in the academic literature. However, the role of business environment as one of the external factors in promoting innovation, productivity and export performance of companies as well as the structural interrelationships between these factors remained relatively unstudied. This paper focuses on the role of the business environment in influencing innovation, productivity, and export performance of firms in transition economies.

In this study, the estimates of the econometric model proved our hypothesis about the impact of business environment reforms on the relationships between R&D investments, innovation, labor productivity and export performance. This study also supports the early findings that R&D is an important determinant of innovation, that innovation is a driver of labor productivity and that labor productivity, in turn, substantially increases the probability of firm's participation at export markets. The

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study's results, generally, imply that business environment reforms in transition economies, which provide incentives for investing in knowledge, innovation activity, productivity enhancement, and exporting represent an important factor for a firm's development.

The rest of the paper is organized as follows. Section 2 of the paper examines the existing literature in the fields of research related to business environment-innovation-productivity-exporting relationships. Research hypotheses have been formulated based on a literature review. In section 3 we turn to a discussion of the research methodology, including empirical strategy and measures, the data set and characteristics of variables used in the study. Section 4 provides an analysis of our results. Final remarks are presented in section 5.

2. Literature Review

This paper focuses on the role of the business environment in influencing innovation, productivity, and export performance of firms in transition economies. The structural link between innovation and productivity on the one hand and productivity and exporting on the other is well acknowledged in the literature. The now large innovation-productivity literature, since the seminal papers of Griliches (1979) and Pakes and Griliches (1980), examines the link between past and current investments in R&D, knowledge generation and productivity growth. This stream of research extended by Crepon, Duguet, and Mairesse (1998) distinguishes between innovation input (research and development investments) and innovation output (knowledge). The approach known as CDM, models productivity by innovation output, while innovation output is explained by innovation inputs. These relationships have been explored and verified in vast number of empirical studies in developed countries (Loof et al., 2003; Griffith et al., 2006; Hall and Mairesse 2006; Mairesse and Robin, 2009; Disoska et al., 2018; Toshevska-Trpchevska et al., 2019) as well as in developing and transition economies (EBRD, 2014; Berulava and Gogokhia, 2016; Berulava and Gogokhia, 2018; Masso and Vahter, 2012; Friesenbichler and Peneder, 2016).

On the other hand, the literature on the relationship between firm's exporting and productivity emphasizes two alternative but not mutually exclusive views (Wagner, 2007; Bernard and Jensen, 1999; Bernard and Wagner, 1997). One group of researchers highlights a learning effect through which participation at export markets makes firms more productive. The other stream of research, built on Melitz's (2003) heterogenous firm assumption, consider that the more productive firms self-select to export markets and that this is an outcome of firm's deliberate strategy. The latter approach provides a sound theoretical ground for understanding structural relationship between productivity and exporting (Bernard and Wagner, 1997; Melitz, 2003).

Some studies explore the impacts of business environment on innovation and productivity and the role of various dimension of business climate in stimulating export activities of firms. For instance, the development studies provide the following empirical evidence: restrictive trade and customs regulations as well as poor customs administration can discourage manufacturing enterprises from exporting (Clarke, 2005); business climate and infrastructure have substantial effects on firm's export capacity (Escribano and Guasch, 2005; Dollar et al., 2005; Iwanow and Kirkpatrick, 2008); services liberalization reducing production costs, increase the productivity in downstream sectors (Arnold, Javorcik and Mattoo, 2011; Arnold, Mattoo and Narciso, 2008; Fernandes and Paunov, 2012) or export performance of manufacturers in transition economies (Berulava, 2011; Berulava, 2012). Véganzonès-Varoudakis and Nguyen (2018) study suggests that productivity performance of companies depends on investment climate limitations. Similarly, Plane and Véganzonès-Varoudakis (2019), while examining the links between firm-level innovation, productivity, exports,

and the investment climate, find that investment climate is an important determinant of innovation processes and productivity performance of Indian manufacturers. Gogokhia and Berulava (2020), applying BEEPS V round survey dataset, explored the role of business environment reforms in enhancing innovation and the productivity performance of individual firms in transition economies. The results of the study reveal statistically significant impact of business environment reforms on the relationships between R&D investments, innovation, and labor productivity. The same time the study reveals that the patterns of the influence on a firm's performance differ across the various dimensions of the business environment. Rialp-Criado & Komochkova (2017), show that the link between innovation processes and exporting performance of Chinese SMEs depends on several business environment dimensions.

Though the innovation-productivity and productivity-export links have been studied very intensively recent years, some aspects of these relationships remained relatively unexplored. First, the relationships between innovation, productivity and exporting within a single structural model requires further examination. Second, the influence of external factors, such as business environment, on these structural relationships also deserves more attention from academicians. In this paper, we aim to overcome existing limitations by exploring the effect of business environment on innovation, productivity and exporting within a single structural framework.

In this context, Antonietti and Cainelli (2011) study that links innovation, productivity and exporting together in a joint model and assesses the impact of external factor on this link, represents a worth considering approach. Specifically, the authors augment CDM model by adding new export equation and by studying the role played by spatial agglomeration externalities in the R&D-innovation-productivity-export performance link. The model comprises five equations, where the first two identify decision and intensity of R&D; the third relates innovation input and output; the forth studies the impact of innovation output on Total Factor Productivity (TFP); and the last links TFP with export performance. The study results show significant and positive effect of various spatial agglomeration indicators on the each element of the R&D-innovation-productivity-export performance link. To attain our goal, we apply Antonietti and Cainelli (2011) structural approach with some modifications. We replace spatial agglomeration factors by business environment dimensions, and further we explore their influence on the R&D-innovation-productivity-exporting structural link using the augmented CDM model.

In academic literature business environment is usually seen as a combination of relevant physical infrastructure and institutions that determine the costs of doing business for individual firms and influence their propensity to innovate and export (Carlin and Seabright, 2009; Iwanow and Kirpatrick, 2008; EBRD, 2014). In this study, we apply the Business Environment Reforms (BER) index from Gogokhia and Berulava (2020) paper as a business environment proxy. The index is calculated as a difference between the mean scores of subjective evaluations of the obstacles from various dimensions of a business environment for innovator and non-innovator firms aggregated by concrete localities. The rational of such approach for measuring business environment reforms is based on the results of the previous empirical studies (EBRD, 2014), which reveal that firms that are engaged in innovative or export activities usually experience higher obstacles than those that are not involved in such kinds of activities. Thus, the lower the difference between innovator and non-innovator firms located in the same region in terms of perceived obstacles for doing business the better (innovation and export facilitating) business environment will be.

In this paper we extend the Gogokhia and Berulava (2020) study by introducing to R&D-Innovation-Productivity structural model an additional equation - exporting. Also, we apply a different approach to estimate these structural relationship – an augmented

CDM model. The model includes five equations - R&D decision equation; R&D intensity equation, Innovation equation, productivity equation, and export equation - and is estimated sequentially or step-by-step. We test the effects of business environment reforms at each stage of the R&D-innovation-productivity-exporting structural link, by including the BER index in each of the consequent equations of the structural model. Thus, our model includes the following stages:

- at the first stage, the firm's R&D choice activity (extensive margin of innovation input) is explained by a BER index and other relevant determinants.
- at the second stage, the firm's R&D intensity (intensive margin of innovation input) is explained by a predicted value of R&D choice and BER index as well as other relevant indicators;
- at the third stage, innovation outputs are linked to innovation inputs and the BER index;
- at the fourth stage, we estimate the impact of a predicted value of an output of innovation and the BER index on firm's labor productivity.
- at the final stage, the firm's choice to engage in export activity performance is modeled by predicted value of a labor productivity and the BER index.

Rest upon the findings from the existing literature, we specify our expectations in the following research hypotheses:

- H1. The lower the business environment reforms index, the higher a firm's extensive margin of R&D.
- H2. The lower the business environment reforms index, the higher the intensity of R&D activity of a firm.
- H3. The lower the business environment reforms index, the higher the probability that a firm is engaged in the innovation activity.
- H4. The lower the business environment reforms index, the higher the level of the labor productivity of a firm.
- H5. The lower the business environment reforms index, the higher the export propensity of a firm.
- H6. R&D has positive and significant impact on innovations.
- H7. Innovation has a positive and significant impact on a firm's productivity.
- H8. Labor productivity of a firm has a positive and significant impact on its export propensity.

3. Research Methodology

The section reviews the sample and data characteristics, measures of dependent and independent variables and econometric model for testing hypothesis.

3.1. Sample and Data Description

The main source of the data for the research is the micro-level dataset from the fifth round of the Business Environment and Enterprise Performance Survey (BEEPS V).[3] The survey was conducted by the European Bank for Reconstruction and Development (EBRD) and the World Bank Group (World Bank) in the European and Central Asian region in the period of 2012-2014. The sample was selected using stratified random sampling techniques. Three levels of stratification were used in all of the countries: industry, establishment size and region. A more detailed description of the sampling methodology can be found in the Sampling Manual.[4]

In this study we use the sample which comprises 28 countries and 9,868 enterprises. Table 1 reports descriptive statistics for the analysis sample.

[3] https://www.enterprisesurveys.org/

[4] http://www.enterprisesurveys.org//~/media/GIAWB/EnterpriseSurveys/Documents/Methodology/Sampling_Note.pdf

Table 1 Descriptive statistics

Variables	Number of Observations	Mean	Standard Deviation
BER index (Total)	9,868	0.189	0.151
BER index – (Business/Economic Regulatory Environment)	9,868	0.161	0.173
BER index – (Infrastructure)	9,868	0.209	0.217
BER index – Political Stability/Legal Environment	9,868	0.227	0.257
R&D variable (dummy)	9,868	0.072	0.258
R&D intensity (ordinal)	9,868	1.122	0.490
Innovation variable (dummy)	9,842	0.278	0.448
Output per employee (Ln)	9,868	10.039	2.158
Export (dummy)	9,868	0.215	0.411
Firm's size	9,868	63.4	280.1
Main Market (International) (dummy)	9,868	0.075	0.264
University degree (%)	9,868	34.2	31.04
Firm's age	9,868	22.6	128.6
Foreign ownership (dummy)	9,868	0.075	0.263
State ownership (dummy)	9,868	0.020	0.141
New (dummy)	9,868	0.832	0.374
Competition	9,868	3.044	0.939
Subsidy (dummy)	9,813	0.088	0.283
Email (dummy)	9,851	0.870	0.336
Foreign technology (dummy)	9,693	0.129	0.335
Managerial experience	9,820	16.44	9.829

According to the table, among business environment reforms indexes, the political stability/legal environment indicator represents the highest obstacle for innovative firms followed by the infrastructural environment indicator. The business/economic regulatory environment indicator imposes the least constraints on a firm's ability and incentive to innovate. On average, 7% of firms invest in R&D while the proportions of establishments that have implemented either product or process innovations are almost four times higher – 27.8%. Twenty-one percent of the companies export their products directly; however, the global market is the main market for only 7.5% of firms. An average establishment employs 63 workers and 34.2% of the employed have a higher education. The mean age of firms in the sample is 22.6 years. More than 83% of firms in the sample are new established entities while 7.5% of the enterprises are owned by foreigners and 2% by the state. On average, a firm in the sample faces competition from six to twenty-five competitors. Almost nine percent of the companies in the sample receive subsidies from the government or the EU. Most of the sample (87%) uses e-mail for communications with their partners. Approximately, thirteen percent of firms utilize foreign licensed technologies. The experience of the top managers in the sector is on average 16 years.

3.2. Measures

The key variable of interest in this study - the Business Environment Reforms index - is adopted from the Gogokhia and Berulava (2020) study.

Business Environment Reforms (BER) index is constructed on the basis of a firm's subjective valuations on a five-item scale (from 0 to 4 where 0 means "no obstacle" and 4 implies a "very severe obstacle") vis-à-vis access to land, access to finance, electricity, telecommunications, tax rates and other indicators of the business environment.[5] Following Gogokhia and Berulava (2020) we constructed four dimensions of business environment: 1) the overall business environment index; 2) business/economic regulatory environment (access to finance, tax rates, tax administration, business licensing and permits, customs and trade regulations, access to land, labor regulation), 3) infrastructural environment (electricity, telecommunications, transport), 4) political stability/legal environment (political instability, corruption, courts). We used a summated scales approach (weighted average of variables incorporated within the factor) to construct each index of the business environment. Finally, using the constructs of the business environment, we calculated the business environment reforms index as a difference between the aggregated mean scores for innovator and non-innovator firms (by country and size of locality). As a result, we obtained four BER indexes: the total index, the business/economic regulatory environment reforms index, the infrastructural environment reforms index and the political stability/legal environment reforms index. It is assumed that the lower difference and the respectively lower BER index indicate better business environment conditions for the innovative, productive and export performance of an individual firm.

The study utilizes the following set of endogenous variables:

R&D_dummy - a dummy variable which indicates whether an enterprise invest in R&D activity.

R&D – the intensive margin of innovation input, is calculated as the ratio of the total R&D expenditures (the sum of spending on internal R&D and external knowledge acquisition) and annual sales. Following Friesenbichler and Peneder (2016), we create an ordinal scale where a value of 1 is assigned to firms that have no R&D-expenditures, 2 - to firms with an R&D to sales ratio below 1.5 percent, 3 - to firms with a ratio between 1.5 and 5 percent and 4 - to those above 5 percent.

Innovation – a dummy variable which indicates whether an enterprise introduces either product or process innovation.

Productivity - measured as a log of the ratio of the total sales to the number of employees. In this study we use this variable as a firm's performance measure.

Export – a dummy variable which indicates whether an enterprise sells products directly on export.

Along with the BER index the model comprises the following set of exogenous variables:

University Degree – the percentage of full-time employees with a university degree reflects the quality of the human capital employed by an establishment.

Firm's Size – a natural logarithm of the number of full-time equivalent employees.

Firm's Age – a natural logarithm of the age of the establishment in years.

Foreign Ownership – a dummy variable which shows whether foreigners have a majority in the ownership.

State Ownership – a dummy variable which indicates whether the state has a majority in the ownership.

New – a dummy variable which indicates whether an enterprise is newly established.

[5] Electricity, telecommunications, transport, customs and trade regulations, access to land, crime, theft and disorder, access to finance, tax rates, tax administration, business licensing and permits, political instability, corruption, courts, labor regulation, inadequately educated workforce.

Competition – an ordinal variable constructed in the same manner as in the Friesenbichler and Peneder (2016) study. Depending on the number of competitors for the principal product/service in the main market, the variable takes the value of 1 if a firm is a monopoly, 2 - if firms have reported one to five competitors, 3 - for values between 6 and 25 competitors and 4 - if they are perceived to have 26 or more competitors.

Subsidy – a dummy variable which shows whether an establishment has received any subsidies from national, regional, or local government of from European Union sources over the last three years.

E-mail – dummy variables meaning that the establishment uses e-mail for communications with its business partners.

Foreign technology - dummy variables meaning that the establishment uses foreign licensed technologies.

Main Market – comprises three indicators – *local*, *national*, *international* – which signify that the main product is sold on local, national or international markets respectively.

Managerial Experience – measured as a top manager's years of experience in this sector.

Country Dummies – dummy variables which reflect country fixed effects. The list of countries in the study: Albania, Armenia, Azerbaijan, Belarus, Bosnia, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kosovo, Kyrgyzstan, Latvia, Lithuania, Macedonia, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Tajikistan, Ukraine, and Uzbekistan.

Industry Dummies – dummy variables which reflect industry fixed effects. The list of industries in the study: manufacturing (food, wood, publishing, printing and recorded media; chemicals, plastics and rubber, non-metallic mineral products, fabricated metal products, machinery and equipment, electronics, precision instruments, furniture), retail, other services (wholesale, IT, hotels and restaurants, services of motor vehicles, construction section, transport, supporting transport activities, post and telecommunications).

As an exclusion restriction to deal with the simultaneity problem we employ the set of variables: *Firm size* is used as selection variable in Type II Tobit model for R&D equation. Previous studies suggest that this variable influence extensive margin of R&D, while having negligible effect on its intensive margin. As an exclusion restriction in R&D intensive margin equation we employ the *Subsidy* variable; in innovation equation - *E-mail* and *Foreign technology* variables; in productivity equation - *Main Market* and *Managerial Experience* variables.

3.3. Econometric Model

In order to study structural relationships between business environment reforms, R&D, innovation, productivity and export performance we apply an augmented version of CDM model. First, we modify the conventional CDM model by introduction of a new equation, which accounts for the effects of productivity on the export performance of companies. Second, in each consecutive stage, we test for the impact of business environment reform (which is proxied by several indexes, discussed above) on the corresponding performance outcome variable. Thus, the modified model comprises five equations, two for R&D (Type II Tobit model), one for innovation (a binary Probit model), one for labor productivity (OLS regression), and one for export behaviour (Probit model). We assume that investing in knowledge capital stimulates companies to introduce innovations, which in turn positively influences its productivity, and through enhanced productivity encourages firms to export its product/services abroad. The

proposed modified CDM model is estimated sequentially step-by-step and is presented below.

$$R\&D\_dummy_i = 1(\alpha_1 BER_i + x_{1i}\beta_1 + \varepsilon_{i1} > 0) \quad (1)$$
$$R\&D_i = \alpha_2 BER_i + x_{2i}\beta_2 + \varepsilon_{i2} \quad (2)$$
$$Innovation_i = 1\left(\alpha_3 BER_i + \gamma_3 \widehat{R\&D_i} + x_{3i}\beta_3 + \varepsilon_{i3} > 0\right) \quad (3)$$
$$Productivity_i = \alpha_4 BER_i + \delta_4 \widehat{Innovation_i} + x_{4i}\beta_4 + \varepsilon_{i4} \quad (4)$$
$$Export_i = 1\left(\alpha_5 BER_i + \theta_5 \widehat{Productivity_i} + x_{5i}\beta_5 + \varepsilon_{i5} > 0\right) \quad (5)$$

Here, *i=1,….., n* is an index of surveyed firms. The *R&D_dummy, R&D, Innovation, Productivity* and *Export* are endogenous variables. In particular, *R&D_dummy* -is extensive margin of research and development; $R\&D_i$ is an intensive margin of R&D regarded also as 'innovation input' variable; $Innovation_i$ stands for innovation output which is proxied by the relevant dummy variable; $Productivity_i$ is performance output variable defined as log of labor productivity; $Export_i$ is dummy variable for direct export. The main research interest represents the impact of the variable BER, which is the business environment reforms index calculated as a factor score. The vectors of explanatory variables are denoted by x_{ki} (with k= 1,…,5); β_k (with k= 1,…,5) is the vector of parameters and α_1, α_2, α_3, α_4, α_5, γ_3, δ_4, and θ_5 are the parameters to be estimated. Random error terms which are assumed to be multivariate normal are defined as ε_{ki} (with k= 1, …, 5). All endogenous and exogenous variables are discussed in the above section in more detail.

The first equation of the modified CDM model presented above accounts for selection into R&D, explains the probability that firm's *i* choice is to invest in R&D. The equation is specified as a Probit model. The second equation in the model describes the intensive margin of R&D for the firm *i*, and is specified as an OLS regression, which relates the intensive margin of R&D to a number of potential determinants including the BER index. It is assumed that these error term of these two equations ε_{i1} and ε_{i2} are correlated with the correlation coefficient ρ_{12}. These two equations represent Generalized (or Type II) Tobit model. The third equation of the model, is specified as a probit regression and models the effects of the BER index, predicted value of R&D intensive margin (which is dependent variable in the second equation) and set of exogenous variables on the probability of firm's choice to introduce product or process innovation. The fourth equation models the log of labour productivity as a function of the BER index, predicted value of Innovation (dependent variable in the third equation), and a set of exogenous variables. And the final (fifth) equation applies a probit model to estimate the dependence of firm's propensity to export on the BER index, predicted value of productivity (dependent variable from the fourth equation) and the set of controls.

Since the BER index is calculated at the macro level and reflects the environment with which an individual firm operates, the endogeneity issue regarding this variable to a greater extent can be discounted. In each of equations (except the last one), exclusion variables ('instruments') are assumed, which allows for identification. To correct the potential bias, caused by the using of predicted instead of actual values for the endogenous variables, we apply bootstrapped standard errors.

4. Study Results

In this study we estimate four alternative models of the recursive system (1). The models differ from each other only by the type of the BER index included in the system. Model 1 employs the total BER index, Model 2 – the business/economic regulatory environment reforms index, Model 3 – the infrastructural environment reforms index

and Model 4 – the political stability/legal environment reforms index. Each model of the system comprises five equations: extensive and intensive margins of R&D, innovation, productivity, and export propensity equations. The full results of the estimation of the Model 1 are presented in Table 2, while the main results for the rest of the models are summarized in Table 3.

Table 2. Total results of the estimation of the structural CDM: Model 1 - BER index (Total)

Variables	**R&D selection equation**	**R&D intensity equation**	**Innovation equation**	**Productivity equation**	**Export equation**
BER index (Total)	**-0.393** (0.198)**	**-0.064 (0.042)**	**-0.378*** (0.136)**	**-0.851*** (0.214)**	**-0.423*** (0.060)**
R&D	-	-	**1.551*** (0.403)**	-	-
Innovation	-	-	-	**3.045*** (0.157)**	**-**
Productivity (Ln Output/worker)	-	-	-	**-**	**0.612*** (0.059)**
Firm's size	0.169*** (0.017)	-	0.079*** (0.016)	-0.051** (0.023)	0.155*** (0.015)
University degree	0.0044*** (0.0008)	0.0006*** (0.0002)	0.0008 (0.0007)	0.002*** (0.0007)	-0.006*** (0.0007)
Firm's age	0.0008** (0.0003)	0.00005** (0.00002)	0.0001 (0.0001)	-0.0002 (0.0002)	0.00009 (0.0001)
Foreign ownership	0.071 (0.074)	0.013 (0.024)	0.036 (0.057)	0.261*** (0.09)	0.451*** (0.061)
State ownership	-0.166 (0169)	-0.023 (0.023)	0.074 (0.115)	0.159 (0.112)	-0.053 (0.123)
New	0.076 (0.062)	0.016 (0.014)	0.126*** (0.045)	0.049 (0.062)	-0.093* (0.051)
Competition	-0.012 (0.023)	0.006 (0.005)	-0.106*** (0.016)	0.013 (0.024)	0.229*** (0.021)
Subsidy	0.368*** (0.062)	0.085** (0.028)	-	-	-
Foreign technology	-	-	0.448*** (0.043)	-	-0.047 (0.060)
Email	-	-	0.409*** (0.058)	-	0.497*** (0.087)
Managerial experience	-	-	-	-0.001 (0.002)	-
Main Market (International)	-	-	-	-0.086 (0.112)	-
Inverse Mills ratio	-	-0.131*** (0.031)	-	-	-
Country dummy	yes	yes	yes	no	no
Industry dummy	yes	yes	yes	yes	yes
Number of observations	9,380	9,380	9,318	9,139	9,131
Wald $\chi 2$	642.2*** (54)	-	1110.2*** (56)	-	1337.7***
Pseudo R-sq.	0.151	-	0.118	-	0.2235
R-sq.	-	0.079	-	0.091	-
F-statistic	-	8.81*** (54; 9,325)	-	35.7*** (31; 9,107)	-
Root MSE	-	0.48	-	2.0875	-
Notes: Bootstrapped standard errors in parentheses; *** — significant at $p < 0.01$ level; ** — significant at $p < 0.05$ level; * — significant at $p < 0.1$ level.					

Table 3. Main Results of the estimation of the structural CDM for alternative models

Variables	R&D selection equation	R&D intensity equation	Innovation equation	Productivity equation	Export equation
Model 2: BER index (Business/Economic regulatory environment)					
BER index (Business/Economic regulatory environment)	**-0.335*** **(0.188)**	**-0.044** **(0.034)**	**-0.323***** **(0.121)**	**-0.911***** **(0.148)**	**-1.573***** **(0.117)**
R&D	-	-	**1.541***** **(0.403)**	-	-
Innovation	-	-	-	**3.468***** **(0.157)**	**-**
Productivity (Ln Output/worker)	-	-	-	**-**	**0.658***** **(0.050)**
Model 3: BER index (Infrastructural environment)					
BER index (Infrastructural environment)	**-0.235**** **(0.118)**	**-0.027** **(0.023)**	**-0.241***** **(0.081)**	**-0.655***** **(0.135)**	**-0.948***** **(0.114)**
R&D	-	-	**1.553***** **(0.403)**	-	-
Innovation	-	-	-	**2.993***** **(0.155)**	**-**
Productivity (Ln Output/worker)	-	-	-	**-**	**0.542***** **(0.050)**
Model 4: BER index (Political stability/Legal environment)					
BER index (Political stability/Legal environment)	**-0.166** **(0.104)**	**-0.033** **(0.026)**	**-0.096** **(0.075)**	**-1.141***** **(0.161)**	**-0.827***** **(0.115)**
R&D	-	-	**1.534***** **(0.404)**	-	-
Innovation	-	-	-	**2.755***** **(0.162)**	**-**
Productivity (Ln Output/worker)	-	-	-	**-**	**0.390***** **(0.045)**

Notes: Bootstrapped standard errors in parentheses;
*** — significant at $p < 0.01$ level; ** — significant at $p < 0.05$ level; * — significant at $p < 0.1$ level.

R&D extensive margin equation. The estimates of the R&D choice equation provide strong support for the hypothesis about the impact of business environment reforms on the extensive margin of R&D. In particular, the H1 hypothesis has been proven in the first three models (in Model 2, the effect of the total BER index on the propensity to invest in R&D is statistically significant only at the 10% level). According to the study's results, the main external drivers of the willingness to invest in R&D activities of firms in transition economies are improvement in general business environment as well as sound reforms in the business/economic regulatory environment and infrastructural environment. The effects of both indexes on the 'innovation inputs' are practically of the same strength. In this study, however, we have found no statistically significant impact of the political stability/legal environment reforms index on an extensive margin of firm's R&D activity.

Other variables in the equation, generally, showed anticipated and similar patterns across the models. In compliance with the Schumpeterian approach to innovation, we have found a significant and positive effect of a firm's size on the propensity to invest in R&D. Also, in accordance with our expectations the availability of subsidies, a higher education level of top management, firm's age has a positive and statistically significant impact on R&D extensive margin.

R&D intensive margin equation. On the contrary, the results of estimation of the 'innovation input' equation provide no support for the H2 hypothesis about the impact of business environment reforms on the intensive margin of R&D. In all four models we have found no statistically significant impact of the BER index on the R&D intensity. Thus, one may conclude that better business environment stimulates firms to make decisions about investing in R&D, while it has no effect on how much to invest. The same (as in previous equation) set of the controls showed statistically significant impact on R&D intensity.

Innovation equation. Like the R&D equation, the estimation results of the 'innovation equation' for the first three models provide strong support for hypothesis H3. Specifically, these estimations suggest improvements in the total BER index as well as in reforms indexes for the business/economic regulatory environment and infrastructural environment substantially enhance innovation outcomes for firms in transition economies. The effects of all these indexes are statistically significant at the 1% level. The relevant reforms in the business/economic regulatory environment have the most important impact on innovation, among other indexes. Like the estimation results obtained at the previous stage, we have found no statistically significant effect of the political stability/legal environment reforms index on the intensity of innovation. Additionally, in compliance with previous empirical studies, we revealed the positive and statistically significant effect of R&D intensity on the innovation output variable across the models. Thus, hypothesis H6 was supported in all four models. Such outcomes lead to the conclusion that the corresponding BER indexes exert both direct and indirect (through R&D) impact on innovation. Other important predictors of innovation are a firm's size, new firm, competition, using e-mail communications and using foreign technologies.

Productivity equation. According to the data from Tables 2 and 3, hypothesis H4 is completely supported in all the models. In particular, the estimation results of the models show that the corresponding BER indexes are important predictors of the productivity performance of an individual firm in transition economies. The effects of all these indexes are statistically significant at least at the 1% level, with the Political stability/Legal environment index having the strongest impact on the labor productivity variable followed by the effect of the business/economic regulatory environment reforms index. As expected, innovation appears to be among the key drivers of a firm's productivity. A higher intensity of innovation leads to a better productivity performance. Thus, in accordance with research findings of previous studies, hypothesis H7 is strongly supported in all four models. Other important predictors of labor productivity are firm's size, human capital, and foreign ownership.

Export equation. Similarly, the hypothesis H5 is supported in all four models, with business/economic regulatory environment reforms index having the strongest impact on the propensity of firms to export their products. All effects of the relevant BER indexes are statistically significant at $p<0.01$ significance level. In compliance with existing theoretical and empirical evidence we find the strong support of the H8 hypothesis about the effects of productivity on the export performance of companies. Other important predictors of the propensity to export are firm's size, human capital, foreign ownership, new firm, competition and using e-mail communications.

5. Summary

This study explored the role of business environment reforms in enhancing the innovation, productivity and export performance of individual firms in transition economies. Using a large sample of firm-level data from the V round of BEEPS survey across 28 transition economies and applying an augmented CDM model, the study

has estimated a structural link between business environment reforms, innovative behavior and the productivity of firms.

The results of our estimations suggest that business environment reforms represent an important external determinant of a firm's innovative and productive performance in transition economies. Thus, the research hypotheses on the link between business environment reforms and a firm's performance outcomes such as R&D and innovation, labor productivity as well as propensity to export, are generally proven. The results of the study suggest that better business environment stimulates firms to make decisions about investing in R&D, while it has no effect on the intensive margin of R&D. However, similar to (Gogokhia and Berulava, 2020) paper, the study's outcomes show that the patterns of the influence on a firm's performance differs across the various dimensions of the business environment. One of the patterns assumes a two-fold effect of business environment reforms on propensity to export: indirect through stimulating a firm's R&D and innovation performance, enhancing labor productivity and direct, probably through reducing transaction costs and the costs of doing business and enhancing governance structures. Such a pattern of the impact is characteristic for the total BER index and the business/economic regulatory environment reforms index. The reforms in the Political/ Legal environment, according to the current research, have no effect on R&D and the innovative activities of firms but they are important for enhancing a firm's productivity. Also, the results of our study support early findings that R&D is an important determinant of innovation, innovation is a driver of labor productivity and that labor productivity substantially increases the probability of firm's participation at export markets.

The main contribution of this study is that it provides new empirical insights into the structural relationship between business environment reforms and the innovation, productivity and export performance of firms in transition economies. The study's results, generally, imply that business environment reforms, providing incentives for investing in knowledge, innovation activity and productivity enhancement in transition economies represents an important factor for a firm's development.

The main limitation of the study is that it employs generally only one proxy for business environment reforms – an aggregated factor based on subjective perceptions of the obstacles for doing business. Future studies may use individual variables and rely on objective indicators of the business environment. Such an approach can improve the specificity and the interpretation of the link between the external environment and business performance and substantially facilitate policy targeting. Also, the cross-sectional nature of the dataset used in this study limits the understanding of the dynamic relationships between business environment reforms, R&D, innovations and a firm's productivity and export performance. We think that the application of panel data sets will allow scholars to clarify this issue.

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